41. (Twice Amended) An optical evaluation method for evaluating processing performed with respect to a substrate having a semiconductor region in a chamber, said method comprising the steps of:

supplying measurement light to the semiconductor region of said substrate in said chamber;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein said processing is a plasma etching process performed with respect to said semiconductor region.

42. (Twice Amended) An optical evaluation method for evaluating processing performed with respect to a substrate having a semiconductor region in a chamber, said method comprising the steps of:

supplying measurement light to the semiconductor region of said substrate in said chamber;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

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wherein said processing is a light dry etching process for removing a damaged layer caused by plasma etching performed with respect to said semiconductor region.

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Sub E cont

45. (Twice Amended) An optical evaluation method for evaluating processing performed with respect to a substrate having a semiconductor region in a chamber, said method comprising the steps of:

supplying measurement light to the semiconductor region of said substrate in said chamber;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein said processing is a process of forming an insulating film on said semiconductor region.

46. (Twice Amended) An optical evaluation method for evaluating processing performed with respect to a substrate having a semiconductor region in a chamber, said method comprising the steps of:

supplying measurement light to the semiconductor region of said substrate in said chamber;

intermittently supplying exciting light to said semiconductor region; and

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calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

Sub Cont

wherein said processing is a dry etching process for removing an insulating film from a top surface of said semiconductor region.

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54. (Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein said second step includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light;

wherein the change rate of the reflectance of the measurement light at a specified energy value of the measurement light which provides a near extremal value in a spectrum of the change rate of the reflectance of the measurement light is calculated in said step of calculating the change rate of the reflectance; and

wherein said specified energy value of the measurement light is any value included In a range of 3.2 to 3.6 eV.

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55. (Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein said second step includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light;

wherein said exciting light is intermittently emitted at a frequency of 1 kHz or less in said step of supplying the exciting light.

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56. (Amended) A method of manufacturing a semiconductor device, said method comprising:

Sub E cont

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step,

wherein dry etching utilizing a plasma is performed in said third step.

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62. (Twice Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein said second step includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light;

said method further comprising, prior to said second step, the steps of:

introducing an impurity at a high concentration into said semiconductor region of said substrate and depositing an interlayer insulating film on said semiconductor region; and

selectively removing said interlayer insulating film by plasma etching to form an opening reaching said semiconductor region,

wherein said third step includes performing light dry etching with respect to the semiconductor region exposed at a bottom surface of said opening to remove a damaged layer caused by said plasma etching and predetermining a proper range of the change rate of the reflectance of said measurement light when an electric property of the semiconductor region is proper and

said fourth step includes performing said light dry etching such that said change rate of the reflectance falls within said proper range.

63. (Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein:

said first step includes forming, as said semiconductor region, a first semiconductor region forming a part of a semiconductor element and a second semiconductor region to be subjected to optical evaluation,

said second step includes evaluating the optical property of said second semiconductor region,

said third step includes performing the etching process with respect to said first and second semiconductor regions simultaneously, and

said fourth step includes controlling the condition for said etching process based on the result of evaluating the optical property of said second semiconductor region.

67. (Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein said first step includes composing a portion of said semiconductor region to be subjected to optical evaluation of n-type silicon.

68. (Twice Amended) A method of manufacturing a semiconductor device, said method comprising:

a first step of forming a substrate having a semiconductor region;

a second step of evaluating an optical property of said semiconductor region;

a third step of performing an etching process with respect to said semiconductor region; and

a fourth step of controlling a condition for said etching process based on an optical property of said semiconductor region evaluated in said second step;

wherein said second step includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light;

wherein said second step includes evaluating the change rate of the reflectance of measurement light by using an ellipsometric-spectroscope.

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73. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein the change rate of the reflectance of the measurement light at a specified energy value of the measurement light which provides a near extremal value in a spectrum of the change rate of the reflectance of the measurement light is calculated in said step of calculating the change rate of the reflectance.

74. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein the change rate of the reflectance of the measurement light of a wavelength of 600 nm or less is calculated in said step of calculating the change rate of the reflectance and said specified energy value of the measurement light is any value included in a range of 3.2 to 3.6 eV.

75. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein said exciting light is intermittently emitted at a frequency of 1 kHz or less in said step of supplying the exciting light.

76. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein a proper range of the change rate of the reflectance of said measurement light when an electric property of the semiconductor region is proper is predetermined, and

said heat treatment is performed in said step of performing the heat treatment with respect to the semiconductor region such that the change rate of the reflectance of said measurement light falls within said proper range.

77. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein a relationship between the change rate of the reflectance of the measurement light in said semiconductor region and an impurity concentration in said semiconductor region is predetermined, and

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the heat treatment is performed with respect to said semiconductor device in said step of performing the heat treatment till the change rate of the reflectance of the measurement light in said semiconductor region reaches a value corresponding to a desired impurity concentration.

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82. (Twice Amended) A method of manufacturing a semiconductor device having a semiconductor region with a structural disorder developed therein, said method comprising the steps of:

evaluating an optical property of said semiconductor region; and

performing a heat treatment for recovering said semiconductor region from the structural disorder, while controlling a condition for the heat treatment based on the optical property of said semiconductor region evaluated in said foregoing step;

said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light,

wherein said second step includes evaluating the change rate of the reflectance of the measurement light by using an ellipsometric spectroscope.

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84. (Twice Amended) A method of manufacturing a semiconductor device according to claim 83, wherein said step of evaluating the optical property includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light.

85. (Twice Amended) A method of manufacturing a semiconductor device according to claim 84, wherein the change rate of the reflectance of the measurement light of a wavelength of 600 nm or less is calculated in said step of calculating the change rate of the reflectance.

86. (Twice Amended) A method of manufacturing a semiconductor device according to claim 85, wherein the change rate of the reflectance of the measurement light of a wavelength of 300 to 600 nm is calculated in said step of calculating the change rate of the reflectance.

87. (Twice Amended) A method of manufacturing a semiconductor device according to claim 84, wherein the change rate of the reflectance of the measurement light at a specified energy value of the measurement light which provides a near extremal value in a spectrum of the change rate of the reflectance of the measurement light is calculated in said step of calculating the change rate of the reflectance.

90. (Twice Amended) A method of manufacturing a semiconductor device according to claim 84, wherein:

a relationship between an amount of introduced impurity and the change rate of the reflectance of said measurement light is predetermined by experiment, and

said impurity is introduced in said step of introducing the impurity into said semiconductor region such that the change rate of the reflectance of said measurement light reaches a value corresponding to a desired amount of introduced impurity.

95. (Twice Amended) A method of manufacturing a semiconductor device according to claim 84, wherein said second step includes evaluating the change rate of the reflectance of the measurement light by using an ellipsometric spectroscope.

97. (Twice Amended) A method of manufacturing a semiconductor device according to claim 96, wherein said second step includes the steps of:

supplying measurement light to said semiconductor region;

intermittently supplying exciting light to said semiconductor region; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light.

98. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, wherein the change rate of the reflectance of the measurement light of a wavelength of 600 nm or less is calculated in said step of calculating the change rate of the reflectance.

99. (Twice Amended) A method of manufacturing a semiconductor device according to claim 98, wherein the change rate of the reflectance of the measurement light of a wavelength of 300 to 600 nm is calculated in said step of calculating the change rate of the reflectance.

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100. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, wherein the change rate of the reflectance of the measurement light at a specified energy value of the measurement light which provides a near extremal value in a spectrum of the change rate of the reflectance of the measurement light is calculated in said step of calculating the change rate of the reflectance.

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103. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, wherein:

a proper range of the change rate of the reflectance of the measurement light when an electric property of the insulating film is proper is predetermined by experiment, and

said fourth step includes forming the insulating film such that the change rate of the reflectance of the measurement light measured in said second step falls within said proper range.

104. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, wherein:

said second step includes measuring the change rate of the reflectance of the measurement light in the semiconductor region before said insulating film is formed thereon, and

said fourth step includes controlling a condition for the formation of the insulating film by remeasuring the change rate of the reflectance of the measurement light in said semiconductor

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region which varies with the progression of the formation of the insulating film and comparing a result of remeasurement with a result of measurement performed in said second step.

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108. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, said method further comprising, after said fourth step, the step of:

judging the formed insulating film to be good or no good based on a relationship predetermined by experiment between the change rate of the reflectance of said measurement light and an electric property of the insulating film.

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111. (Twice Amended) A method of manufacturing a semiconductor device according to claim 97, wherein said second step includes evaluating the change rate of the reflectance of the measurement light by using an ellipsometric spectroscope.

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113. (Twice Amended) A method of manufacturing a semiconductor device according to claim 112, wherein said second step includes the steps of:

supplying measurement light to said semiconductor region through said insulating film;

intermittently supplying exciting light to said semiconductor region through said insulating film; and

calculating a change rate of a reflectance of the measurement light by dividing a difference between the respective reflectances of the measurement light in the presence and absence of said exciting light supplied to said semiconductor region by the reflectance of the measurement light in the absence of the exciting light.

114. (Twice Amended) A method of manufacturing. a semiconductor device according to claim 113, wherein the change rate of the reflectance of the measurement light of a wavelength of 600 nm or less is calculated in said step of calculating the change rate of the reflectance.

115. (Twice Amended) A method of manufacturing a semiconductor device according to claim 114, wherein the change rate of the reflectance of the measurement light of a wavelength of 300 to 600 run is calculated in said step of calculating the change rate of the reflectance.

116. (Twice Amended) A method of manufacturing a semiconductor device according to claim 113, wherein the change rate of the reflectance of the measurement light at a specified energy value of the measurement light which provides a near extremal value in a spectrum of the change rate of the reflectance of the measurement light is calculated in said step of calculating the change rate of the reflectance.

119. (Twice Amended) A method of manufacturing a semiconductor device according to claim 113, wherein:

a proper range of the change rate of the reflectance of the measurement light when the removal of said insulating is properly completed is predetermined, and

said fourth step includes performing dry etching with respect to the insulating film such that the change rate of the reflectance of the measurement light measured in said second step falls within said proper range.

120. (Twice Amended) A method of manufacturing a semiconductor device according to claim 113, wherein:

said second step includes measuring the change rate of the reflectance of the measurement light in the semiconductor region when said insulating film is formed thereon, and

said fourth step includes controlling a condition for the removal of the insulating film by remeasuring the change rate of the reflectance of the measurement light in said semiconductor region which varies with the progression of the removal of the insulating film and comparing a result of remeasurement with a result of measurement performed in said second step.

127. (Twice Amended) A method of manufacturing a semiconductor device according to claim 113, wherein said second step includes evaluating the change rate of the reflectance of the measurement light by using an ellipsometric spectroscope.

128. (Twice Amended) A method of controlling an apparatus for manufacturing a semiconductor device comprising a chamber for containing a substrate having a semiconductor region, processing means for performing processing with respect to said substrate in said chamber, first light supplying means for intermittently supplying exciting light to the semiconductor region of said substrate placed in said chamber, a second light supplying means for supplying measurement light to said semiconductor region, and reflectance measuring means for measuring a reflectance of the measurement light supplied to said semiconductor region, said method comprising :

a first step of supplying the measurement light to said semiconductor region;

a second step of intermittently supplying the exciting light to said semiconductor region;